6.1 Climate and Meteorology

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Meteorological measurements are taken to support 1) Hanford Site emergency preparedness and response, 2) Hanford Site operations, and 3) atmospheric dispersion calculations. Support is provided through weather forecasting and the maintenance and distribution of climatological data. Forecasting is provided to help manage weather-dependent operations. Climatological data are provided to help plan weather-dependent activities and are used as a resource to assess the environmental effects of Hanford Site operations.

The Cascade Mountains to the west of Yakima greatly influence the climate of the Hanford Site. These mountains create a rain shadow effect and also serve as a source of cold air drainage, which significantly effects the wind regime.

The Hanford Meteorology Station is located on the 200 Area Plateau, where the prevailing wind direction is from the northwest during all months of the year. The secondary wind direction is from the southwest. Summaries of wind direction indicate that winds from the northwest quadrant occur most often during winter and summer. During spring and fall, the frequency of southwesterly winds increases, with a corresponding decrease in the northwesterly flow. Monthly average wind speeds are lowest during winter months, averaging 10 to 11 km/h (6 to 7 mph), and highest during summer, averaging 13 to 15 km/h (8 to 9 mph). Wind speeds that are well above average are usually associated with southwesterly winds. However, summertime drainage winds are generally northwesterly and frequently reach 50 km/h (30 mph). These winds are most prevalent over the northern portion of the Site.

Daily and monthly averages and extremes of temperature, dew point temperature, and relative humidity 1945 through 1994 have been reported by Hoitink et al. (1995). From 1945 through 1994, the record maximum temperature was 45°C (113°F) recorded in August 1961, and the record minimum temperature was -30.6°C (-23°F) in February 1950. Normal monthly temperatures ranged from a low of -0.4°C (31.3°F) in January to a high of 24.6°C (76.2°F) in July. During winter, the highest monthly average temperature at the Hanford Meteorology Station was 6.9°C (44.5°F) in February 1991, and the record lowest was -11.1°C (12.1°F) in January 1950. During summer, the record maximum monthly average temperature was 27.9°C (82.2°F) in July 1985, and the record minimum was 17.2°C (63.0°F) in June 1953. The annual average relative humidity at the Hanford Meteorology Station was 54%. Humidity was highest during winter, averaging about 76%, and lowest during summer, averaging about 36%. Average annual precipitation at the Hanford Meteorology Station was 16 cm (6.26 in.). The wettest year on record, 1995, received 31 cm (12.30 in.) of precipitation, while the driest, 1976, received 8 cm (2.99 in.). Most precipitation occurred during winter, with more than half of the annual amount occurring from November through February.

Atmospheric dispersion is a function of wind speed, wind duration and direction, atmospheric stability, and mixing depth. Dispersion conditions are generally good if winds are moderate to strong, the atmosphere is of neutral or unstable stratification, and there is a deep mixing layer. Good conditions associated with neutral and unstable stratification exist about 57% of the time during summer. Less favorable conditions may occur when wind speed is light and the mixing layer is shallow. These conditions are most common during winter, when moderately to extremely stable stratification exists about 66% of the time. Occasionally, there are extended periods of poor dispersion conditions, primarily during winter, which are associated with stagnant air in stationary high-pressure systems.

Results of 1995 Monitoring

1995 was warmer than normal and the wettest year on record. The average temperature for 1995 was 12.6°C (54.7°F), which was 0.7°C (1.2°F) above normal (11.8°C [53.3°F]). Eight months during 1995 were warmer than

normal, and four months were cooler than normal. February had the highest positive departure, 2.8°C (5.1°F), while August, at 1.7°C (3.1°F) below normal, had the largest negative departure.

Precipitation for 1995 totaled 31.3 cm (12.30 in.), 196% of normal (15.9 cm [6.3 in.]), with 19.6 cm (7.7 in.) of snow (compared to an annual normal snowfall of 35.1 cm [13.8 in.]). The previous wettest year on record was 1950, with 29.1 cm (11.45 in.) of precipitation.

The average wind speed for 1995 was 12.6 km/h (7.8 mph), which was 0.2 km/h (0.1 mph) above normal, and the peak gust for the year was 98 km/h (61 mph) on December 12. Figure 6.1.1 shows the 1995 wind roses (diagrams showing direction and frequencies of wind) at 10 m for meteorological monitoring stations on and around the Hanford Site.

Table 6.1.1 provides monthly climatological data from the Hanford Meteorology Station for 1995.

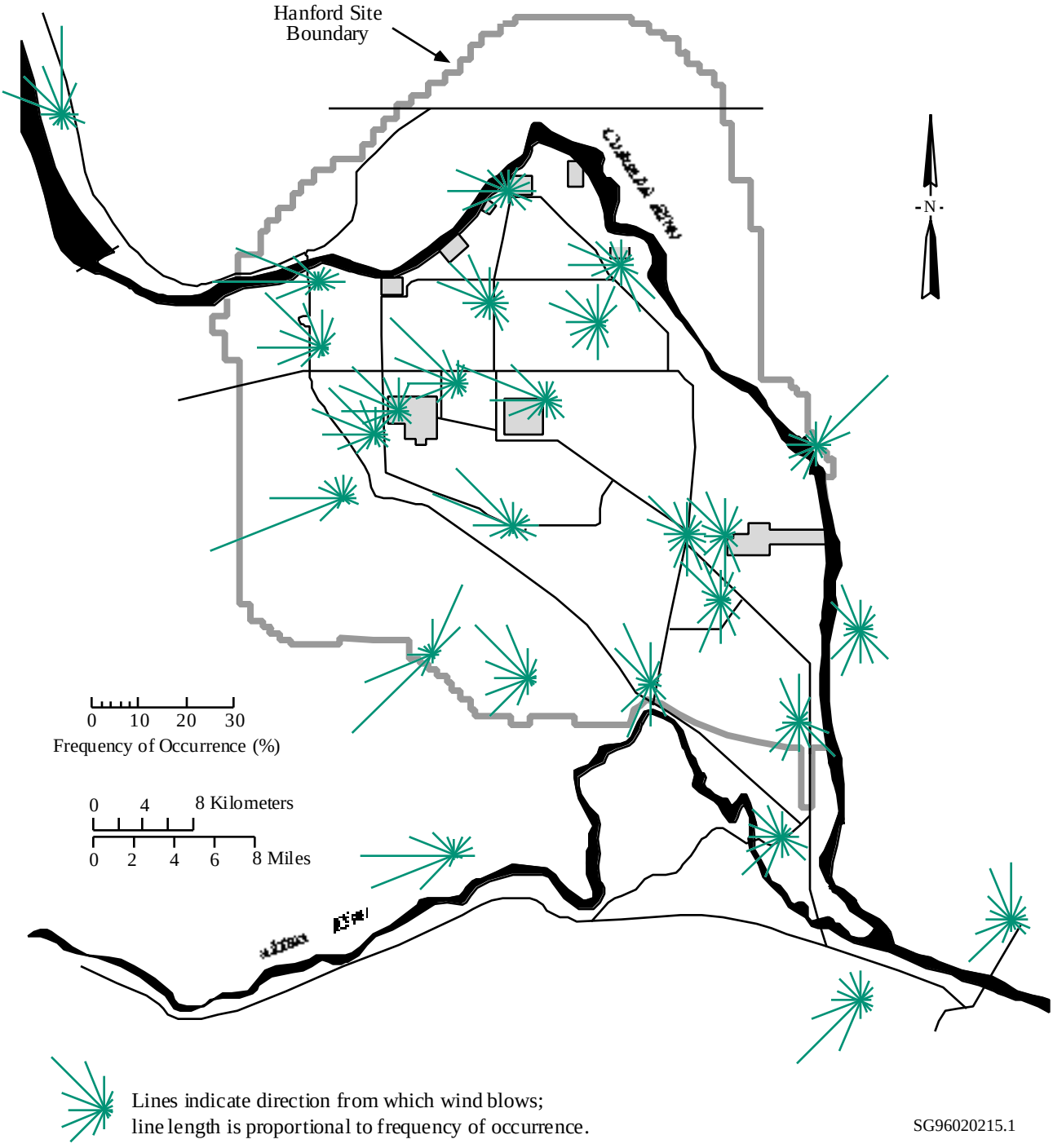

Figure 6.1.1. Hanford Meteorological Monitoring Network Wind Roses (at 10 m), 1995. Individual lines indicate direction from which wind blows. Length of line is proportional to frequency of occurrences from a particular direction.

Table 6.1.1. Monthly Climatological Data from the Hanford Meteorology Station, 1995

Hanford Meteorology Station, 40 km N.W. of Richland, Washington
Latitude 46° 34'N, Longitude 119° 35'W, Elevation 223 m (733 ft)

Month	Temperatures, °C								Precipitation (cm)				Relative Humidity (%)		15-m Wind[a]				
	Averages				Extremes						Snowfall						Peak Gusts		
	Daily Maximum	Daily Minimum	Monthly	Departure[b]	Highest	Date	Lowest	Date	Total	Departure[b]	Total	Departure[b]	Average	Departure[b]	Average Speed, km/h	Departure[b]	Speed, km/h	Direction	Date
J	4.9	-2.4	1.2	+1.6	19.4	31	-13.3	4+[c]	5.4	+3.4	6.9	-3.0	85.1	+8.7	10.9	+0.5	63	WSW	31
F	11.7	0.6	6.2	+2.8	20.0	21+[c]	-13.3	14	1.8	+0.2	T[d]	-5.1	66.7	-3.6	13.4	+1.8	71	SSW	17
M	14.4	1.3	7.8	+0.3	20.6	30	-6.1	6	2.4	+1.2	0	-0.8	56.8	+0.9	13.5	+0.2	79	SW	9
A	18.4	4.4	11.4	-0.1	26.7	24	-2.2	15	3.9	+2.9	T[d]	0	53.6	+6.4	13.8	-0.6	63	SW	4
M	25.8	10.3	18.1	+1.8	35.0	29	3.9	12	2.0	+0.7	--[e]	--	45.2	+2.5	14.3	-0.3	87	E	25
J	27.4	12.8	20.1	-0.8	36.7	30	8.3	12	2.0	+1.0	--	--	44.9	+6.1	14.0	-0.8	68	NW	5
J	33.4	16.8	25.1	+0.5	40.6	19	11.1	31	0.9	+0.4	--	--	37.8	+4.3	15.1	+1.0	84	WSW	6
A	30.7	13.7	22.2	-1.7	38.9	4	7.2	14	0.2	-0.5	--	--	39.0	+3.2	13.7	+1.0	64	NW	23
S	29.4	12.7	21.1	+2.4	38.3	2	5.6	23	2.0	+1.2	--	--	45.4	+2.7	11.1	-0.8	63	WSW	30
O	17.9	4.4	11.2	-0.4	23.3	15	-8.9	31	2.2	+1.2	0	-0.2	61.0	+5.8	11.3	+0.8	77	WNW	3
N	12.2	1.4	6.8	+2.2	20.6	8	-8.3	3+[c]	2.6	+0.3	2.5	-2.0	76.2	+2.8	10.9	+0.6	90	SSW	29
D	3.6	-2.9	0.3	+0.7	13.9	1	-8.9	7	5.9	+3.3	10.2	-4.3	82.3	+2.0	9.0	-0.5	98	SSW	12
Y[f]	19.2	6.1	12.6	+0.7	40.6	Jul 19	-13.3	Feb 14+[c]	31.3	+15.4	19.6	-15.4	57.8	+3.5	12.6	+0.2	98	SSW	Dec 12

(a) Measured on a tower 15 m (50 ft) above the ground.
(b) Departure columns indicate positive or negative departure of meteorological parameters from 30-year (1961-1990) climatological normals.
(c) + after date indicates latest of several occurrences.
(d) Trace.
(e) -- means no record of any snow fall during these months.
(f) Yearly averages, extremes, and totals.